

UNITED STATES PATENT APPLICATION

FOR

SYSTEM AND METHOD FOR DETECTING AND MONITORING
NONCOMPLIANT INTERSTATE TRANSPORTATION OF MATERIALS

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SYSTEM AND METHOD FOR DETECTING AND MONITORING NONCOMPLIANT INTERSTATE TRANSPORTATION OF MATERIALS

CROSS-REFERENCE TO RELATED APPLICATION

5 This application is claiming under 35 U.S.C. §119(e) the benefit of
Provisional Patent Application Serial No. 60/326,172, filed September 28,2001.

FIELD OF THE INVENTION

 The present invention relates to vehicle radiation detection systems, and
10 more particularly to a system for detecting and monitoring noncompliant
interstate transportation of radioactive materials.

BACKGROUND OF THE INVENTION

 Vehicle and rail radiation detection systems that detect the presence of
15 radioactive materials in vehicles containing scrap metals or waste materials are
known. The systems are typically installed at metal recycling centers or waste
dumps to monitor vehicles entering the site to ensure that no material being
dumped emits radiation above a certain level. Examples of such systems include
the Vehicle and Rail Radiation Detection System by Rad/Comm Systems of
20 Valparaiso, Indiana, and the Vanguard System by ThermoEberline of Santa Fe,
New Mexico.

 These systems typically include a microprocessor controller and large
detector assemblies mounted on each side of a vehicle pass-through such as, a

road or railroad track. In operation, a truck or rail car passes the detectors and the data collected by the detectors is transferred to the controller. If the detected radiation levels exceed a certain threshold, the controller emits an alarm to alert an operator. In the Vanguard system, the detected radiation levels collected by the detectors are continually printed as a graph on a paper tape for viewing by the operator.

Although such systems effectively inform an operator of radioactive loads, the systems have disadvantages. One problem is that there is no association between the plotted radiation levels and the vehicles passing-through the system. That is, the operator has no way of knowing which radiation levels on the graph belong to which truck.

Another problem is that once a vehicle sets off the alarm and the vehicle leaves the site, there is no way to monitor the whereabouts of the vehicle. Finally, little or no thought is given to how the information about the vehicle should be used or communicated to proper authorities.

Although current detection systems protect against the dumping of noncompliant materials such as radioactive waste, these systems fail to protect against illegal and noncompliant interstate transportation of such materials. The present invention addresses such a need.

SUMMARY OF THE INVENTION

The present invention provides a method and system for detecting and monitoring noncompliant interstate transportation of materials. The method and system include providing a detection and monitoring network whereby multiple
5 ports-of-entry are each equipped with a detection system that is in communication with a central computer. The detection systems are then used to detect levels of a material in vehicles passing through the ports-of-entry. The method and system further include associating the levels of material detected for each vehicle with the respective vehicle, and saving the vehicle material levels
10 on a computer. The material levels detected at each port-of-entry are then uploaded to the central computer for monitoring and review.

According to the method and system disclosed herein, the present invention associates the detector data with the appropriate vehicles and allows
15 the proper authorities to be notified of vehicles transporting noncompliant and/or illegal payloads across state and national borders with minimal manpower.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram illustrating a port-of-entry detection and reporting
20 network in accordance with a preferred embodiment of the present invention.

FIGS. 2 and 3 are diagrams illustrating regional and federal detection and monitoring network, respectively.

FIG. 4 is a flow chart illustrating a method for detecting and monitoring noncompliant interstate transportation of radioactive materials.

FIG. 5 is a block diagram illustrating a detection and monitoring network in accordance with a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to the detection and reporting of noncompliant or illegal transportation of materials. The following description is presented to enable one of ordinary skill in the art to make and use the invention and is provided in the context of a patent application and its requirements. Various modifications to the preferred embodiments and the generic principles and features described herein will be readily apparent to those skilled in the art. Thus, the present invention is not intended to be limited to the embodiments shown but is to be accorded the widest scope consistent with the principles and features described herein.

Due to the increased use of nuclear energy and the disarmament of nuclear weapons, the interstate transportation of nuclear waste for disposal is proliferating. The applicants of the present application have recognized that the rising amounts of nuclear materials on interstate highways and other forms of transportation provide greater opportunity for the materials falling into the hands

of terrorists, and increases the risk of abuses by transporters who are anxious to cut costs.

Current means for detecting such noncompliant transportation across
5 state and national borders are inadequate. On interstate highways, trucks
passing state borders pass-through a port-of-entry in which the trucks are
sometimes measured for radioactivity by an operator performing a hand-held
scan of the truck. This method not only requires human intervention, but is also
error prone. First, not all port-of-entry may be equipped with hand-held
10 scanners. And for the ones that are, only suspicious trucks are typically
checked, leaving the potential for many noncompliant trucks to pass-through
undetected. In addition, states do not have the manpower to check the
thousands of trucks traversing the nation's ports-of-entries nor the training
resources necessary to train more operators. Therefore, there is a long felt but
15 unsolved need to protect the public from illegal and noncompliant interstate
transportation of materials, such as radioactive waste.

The present invention addresses this need by providing an interstate
transportation detection and monitoring network, whereby state and national
20 ports-of-entry are equipped with vehicle radiation detection systems that
measure and save the detected radiation levels of each vehicle in an electronic
file, and associate the file with the respective vehicle. Each port-of-entry
detection system then transmits the vehicle radiation files to a central database

for governmental monitoring and review. According to the present invention, the port-of-entry detection systems allows the proper governmental agency to be notified of vehicles transporting noncompliant and/or illegal payloads across state and national borders with minimal manpower.

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Referring now to FIG. 1, a port-of-entry detection and reporting network is shown in accordance with a preferred embodiment of the present invention. According to the present invention, the port-of-entry detection and monitoring network 8 comprises multiple state and/or national ports of entry 10, which each
10 are equipped with a detection and reporting system 12 that are in communication with a central government agency computer 22.

Each detection and reporting system 12 at the ports-of-entry 10 include a detector system 14, which includes detector assemblies 14a mounted on each
15 side of a vehicle pass-through and a controller 14b. In a preferred embodiment, the detector assemblies 14b detect radiation levels. As stated above, examples of such systems include radiation detection systems produced by RadComm and ThermoEberline. Those of ordinary skill in the art, however, will readily understand that the present invention may be used with other types of detectors
20 that detect the levels other materials, such as drugs or bombs, for example.

According to the present invention, a computer 16 is connected between the detector system 14 and the government agency computer 22. A digital

camera 18 and a scanner 20 are connected to the computer 16. According to the present invention, the computer 16 is connected to the controller 14b and runs a software application 24 that extracts the stream of detector data from the controller 14b, and saves the data in a file for each vehicle. The computer 16
5 then reports the detected radiation levels of each vehicle to the central government agency computer 22.

The government agency computer 22 may be run by either a state or federal agency (e.g., an Environmental Protection Agency or Department of
10 Transportation). According to another aspect of the present invention, the detection and monitoring network may be used within a single state to create a state network, used within a group of states to create a regional network, or used across the nation to create a federal network.

15 FIG. 2 is a diagram illustrating a regional detection and monitoring network, and FIG. 3 is a diagram illustrating a federal detection and monitoring network. In the regional detection and monitoring network 40 shown in FIG. 2, the port-of-entry detection and reporting system 12 in those states report to a regional agency 42. In the federal detection and monitoring network 44 shown in
20 FIG. 3, the port-of-entry detection and reporting systems 12 are located at state and federal borders and report to a federal agency 46, such as the Environmental Protection Agency.

FIG. 4 is a flow chart illustrating a method for detecting and monitoring noncompliant interstate transportation of radioactive materials in accordance with the present invention. In a preferred embodiment, the process begins once the detectors 14a begin transmitting radiation data to controller 14b in step 50. With commercial detection systems 14, the detectors typically transmit data on a continual basis, and controller 14b filters background radiation. The software application 24 periodically requests the radiation data from the controller 14 (e.g., 1/sec.) and receives the data as a string of characters in step 52. The software application 24 then converts the string into radiation levels and displays the radiation levels on the computer 16 for an operator in step 54.

When a vehicle is detected between the detector assemblies 14a, the software application 24 begins storing the radiation levels in an array in step 56. Once the vehicle leaves the detection assemblies 14a, the application 24 associates the measured radiation levels with the vehicle by storing the array in a file created for the vehicle in step 58. In a preferred embodiment, the file is identified by a vehicle number that is assigned to each vehicle that passes through the detector units.

It is then determined if the detected levels of radiation exceed a predetermined threshold in step 60. This may be done by comparing a geometric mean of the detectors 14a and a calculation of the vehicle surface reading with a predetermined threshold. If the radiation levels exceed the

threshold, then an alarm is signaled to alert the operator and the application 24 creates a subfolder for the vehicle for storing pictures from the digital camera 18 and images from scanner in step 62. Thereafter, pictures of the identification markings on the vehicle taken by the digital camera 18 and scanned copies of the vehicle's shipping documents created by the scanner 20 are uploaded to the computer 16 in step 64.

In one preferred embodiment, the picture taking and scanning is performed manually by an operator. If the vehicle is a truck or car, the vehicle can be instructed to pull to the side of the road for this process. However, in another preferred embodiment, the digital camera 18 may be integrated with the port-of-entry computer 16 for automatic picture taking, assuming that the operator can control the camera 18 from the computer 16. The radiation level file for the vehicle, the images of the vehicle, and the scanned shipping documents are stored in the vehicle's subfolder in step 66. The vehicle files and subfolders are then uploaded to the government agency computer 22 in step 68 either on a batch or individual basis. In the case of an alarm, the vehicle's subfolder may be uploaded immediately.

If the port-of-entry computer 16 and the government agency computer 22 are connected via a modem, then the upload process may be made more secure by requiring that the port-of-entry computer 16 first dial the government agency computer 22 and after communication is made, hangs up. In response, the

government agency computer 22 then calls back the port-of-entry computer 16. Once a connection is made, the government agency computer 22 appears as a disk drive on the port-of-entry computer 16, and the operator of the port-of-entry computer 16 may drag and drop selected files and folders to the government
5 agency computer 22.

If the port-of-entry computer 16 and the government agency computer 22 are connected via a secure connection or via the Internet, then the files may be uploaded from the port-of-entry computer 16 automatically and stored in a
10 database on the government agency computer 22. In addition, an encryption protocol can be used to protect the file transfers and deter hackers.

FIG. 5 is a block diagram illustrating a detection and monitoring network in accordance with a second embodiment of the present invention, where like
15 components from FIG. 1 have like reference numerals. The second embodiment provides a server-based detector and monitoring network 100, where all port-of-entry systems 10' include an internet appliance 102 or modem that is connected to a central server 104 via a common carrier, the Internet or dedicated network. The central server 104 maintains a national database 106 for vehicles, which is
20 indexed on a unique vehicle identification number. The central server 104 is also accessible by the Environmental Protection Agency 108, as well as state agencies 110.

The second embodiment of the present invention assumes the existence of a federal regulation that requires all cars and trucks to bear an identification mark, such as a bar-code 114, containing a unique vehicles identification number. Assuming that the law requires the bar-code 114 be placed on cars and trucks in standard positions, the detection assemblies 14a at each port-of-entry could be provided with bar-code scanners 116. This monitoring system could include a tracking system using transponders tracked by satellite similar to those on Waste Isolation Pilot Project (WIPP) transportation vehicles or those used by the ONSTAR™ tracking system.

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In operation, as each vehicle passes the detection assemblies 14a, the bar-code 114 is scanned for the identification number (and any optional shipping information). The Internet appliance 102 then saves the vehicle's detector readings in a file named after the identification number, and uploads the file to the server 104. Alternatively, the vehicle identification number may be saved in the file itself. Once uploaded to the server 104, the detector readings in the file are stored in the national database 106 under the vehicle's record.

When a vehicle triggers an alarm, the server 104 may automatically notify the Environmental Protection Agency 108 for the appropriate action. In addition, the database 106 is accessible by the state agencies 110 for queries.

According to the present invention, the detection and monitoring systems of the present invention allow the federal government to monitor shipments across the country. For example, if a vehicle enters a state and passes through a port-of-entry for that state without causing an alarm, but then enters the adjoining state and triggers an alarm, either the government agency computer 22 or the national database 106 can be accessed to determine that the vehicle must have picked up the noncompliant load in the first state. The proper authorities can then be dispatched to investigate the source of the contaminant.

10 A detection and monitoring network has been disclosed that protects the public from the transportation of noncompliant and illegal materials across state and federal borders. The present invention has been described in accordance with the embodiments shown, and one of ordinary skill in the art will readily recognize that there could be variations to the embodiments, and any variations would be within the spirit and scope of the present invention. Accordingly, many
15 modifications may be made by one of ordinary skill in the art without departing from the spirit and scope of the appended claims.